

CLAIMS

What is claimed is:

1. A method for forming a thin injection molded article comprising the steps of:

preparing a liquid composite resin material comprising 100 parts by weight of a polymer and between 1 and 15 parts by weight of an organic clay dispersed in the polymer, wherein

the polymer comprises polyphenylene oxide and a butadiene-styrene copolymer, and

the organic clay comprises at least one member selected from the group of inorganic clays consisting of montmorillonite, saponite, hectorite, beidellite, stevensite, nontronite, vermiculite, halloysite, mica, fluorinated mica, kaolinite and pyroferrite, the at least one member having been rendered organic through treatment with at least one organic agent, wherein the treatment also separates layers of the organic clay to form mono layer particles; and

injecting a flow of the composite resin material into a mold, the composite resin material being injected into the mold through a mold gate and flowing within the mold in a manner characterized by a maximum flow length L to fill the mold substantially completely and form the thin injection molded article having an average thickness t, the maximum flow length L and the average thickness t of the thin injection molded article satisfying the inequality: $L/t \geq 70$;

treating the thin injected molded article to produce a substantially solid composite resin material within the mold, the solid composite resin material having a tensile modulus of at least 2.59 GPa and a dielectric breakdown strength of at least greater than 21.1 kV/mm; and
removing the thin injected molded article from the mold.

2. A method for forming a thin injection molded article according to Claim 1, wherein the at least one organic agent is selected from a group of organic onium ions consisting of hexylammonium, octylammonium, 2-ethylhexylammonium, decylammonium, dodecylammonium, laurylammonium, hexadecylammonium, octadecylammonium, dioctyl-dimethylammonium, trioctylammonium, dioctadecyldimethylammonium, trioctadecylammonium, tetraethylphosphonium, triethylbenzylphosphonium, tetra-n-butylphosphonium, tri-n-butylhexadecylphosphonium and tri-n-butylbenzylphosphonium ions.

3. A method for forming a thin injection molded article comprising the steps of:

preparing a liquid composite resin material comprising 100 parts by weight of a polymer and between 1 and 15 parts by weight organic clay dispersed in the polymer, wherein

the polymer comprises polyphenylene oxide and a butadiene-styrene copolymer, and

the organic clay comprises at least one member selected from the group of inorganic clays consisting of montmorillonite, saponite, hectorite, beidellite, stevensite, nontronite, vermiculite, halloysite, mica, fluorinated mica, kaolinite and pyroferrite, the at least one member having been rendered organic through treatment with at least two organic agents; and

injecting a flow of the composite resin material into a mold, the composite resin material being injected into the mold through a mold gate and flowing within the mold in a manner characterized by a maximum flow length L to fill the mold substantially completely and form the thin injection molded article having an average thickness t, the maximum flow length L and the average thickness t of the thin injection molded article satisfying the inequality: $L/t \geq 70$;

treating the thin injected molded article to produce a substantially solid composite resin material within the mold, the solid composite resin material having a tensile modulus of at least 2.59 GPa and a dielectric breakdown strength of at least greater than 21.1 kV/mm ; and

removing the thin injected molded article from the mold.

4. A method for forming a thin injection molded article according to Claim 3, wherein the organic agent is selected from a group of organic onium ions consisting of hexylammonium, octylammonium, 2-ethylhexylammonium, decylammonium, dodecylammonium, laurylammonium, hexadecylammonium, octadecylammonium, dioctyldimethylammonium, trioctylammonium, dioctadecyldimethylammonium, trioctadecylammonium, tetraethylphosphonium, triethylbenzylphosphonium, tetra-n-butylphosphonium, tri-n-butylhexadecylphosphonium and tri-n-butylbenzylphosphonium ions.

5. A method for forming a thin injection molded article according to claim 5, wherein the dielectric breakdown strength is not more than about 22.7 kV/mm.

6. A method for forming a thin injection molded article according to claim 7, wherein the dielectric breakdown strength is not more than about 22.7 kV/mm.